



MEaSUREs Land Surface Temperature and Emissivity data records

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Marshall Space
Flight Center



MEaSUREs: Making Earth System Data Records for Use in Research Environments

A Unified and Coherent Land Surface Temperature and Emissivity (LST&E) Earth System Data Record (ESDR) for Earth Science:

ESDR	Spatial Resolution	Coverage	Temporal Resolution	Time Period
LEO LST	1 km	Global	Daily, 8-day	2000-2017
GEO LST	5 km	N/S. America	N. America-hourly S. America-3 hourly	2000-2017
CAMEL Emissivity	5 km	Global	Monthly	2000-2017

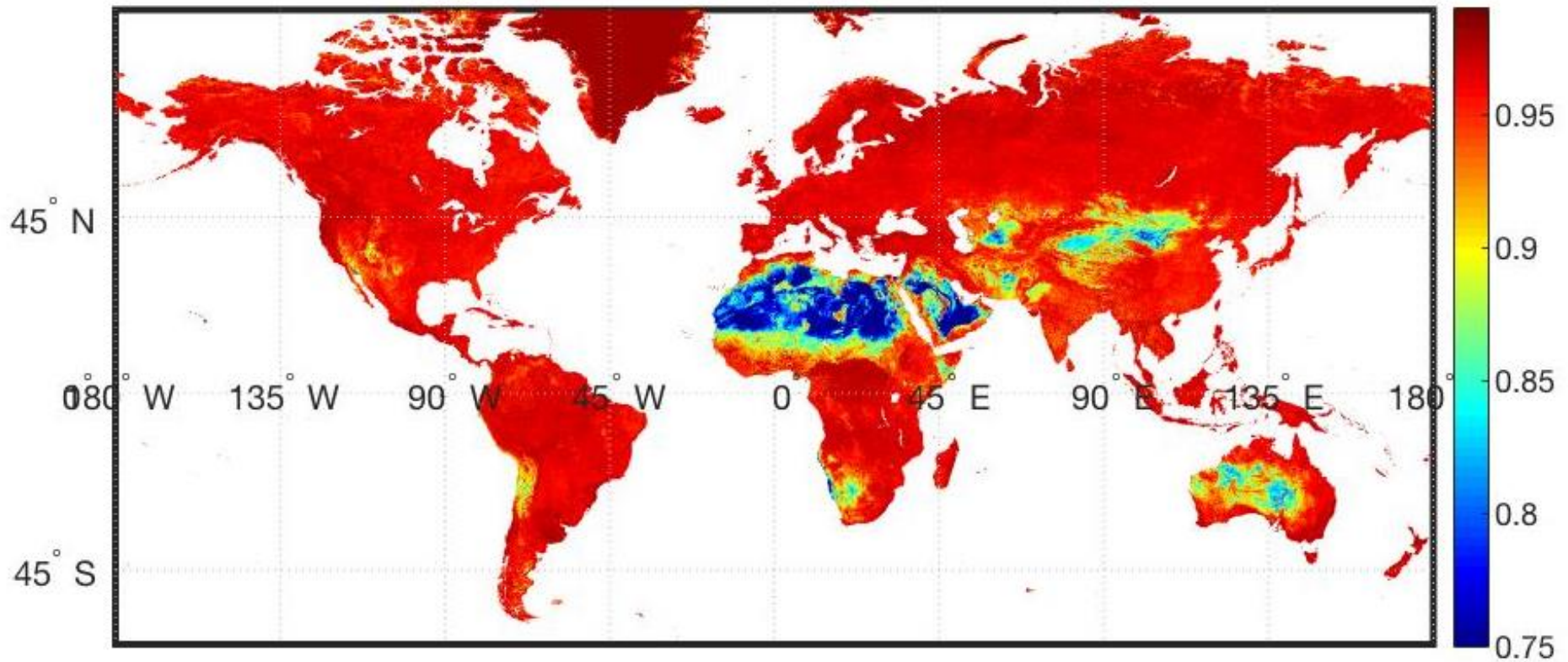
Combined ASTER MODIS Emissivity for Land (CAMEL)

- Produced by merging the UW-Madison MODIS Infrared emissivity dataset (UWIREMIS), and the JPL ASTER Global Emissivity Dataset v4 (GEDv4)
- 0.05-degree resolution 417 bands, 3.6-14.3 μm
- Available for download from LP DAAC

CAMEL current and future users

Institution	Intended Use/Implementation
UK Metoffice	Implemented in RTTOV radiative transfer code
NUCAPS team	Testing in NOAA sounder atmospheric retrieval scheme (IASI, SNPP, AIRS)
EUMETSAT	IASI L2 retrieval first guess
NOAA CRTM	Used in forward model of the Community Radiative Transfer Model
NOAA NCEI	HIIRS climate data record
EC	Environmental Canada, data assimilation
NRL	Naval Research Lab, data assimilation
Meteo-France	Data assimilation
DWD	German Meteorological Office data assimilation
SSEC/GEOCAT	Radiative transfer
EUMETSAT	MeteoSwiss Data assimilation
Nanjing Univ.	Research
CIMSS	MODIS atmospheric water vapor retrievals (MxD07)
JPL	LST retrievals and first guess in AIRS optimal estimation retrievals

CAMEL emissivity at 9.1 μm for July 2004





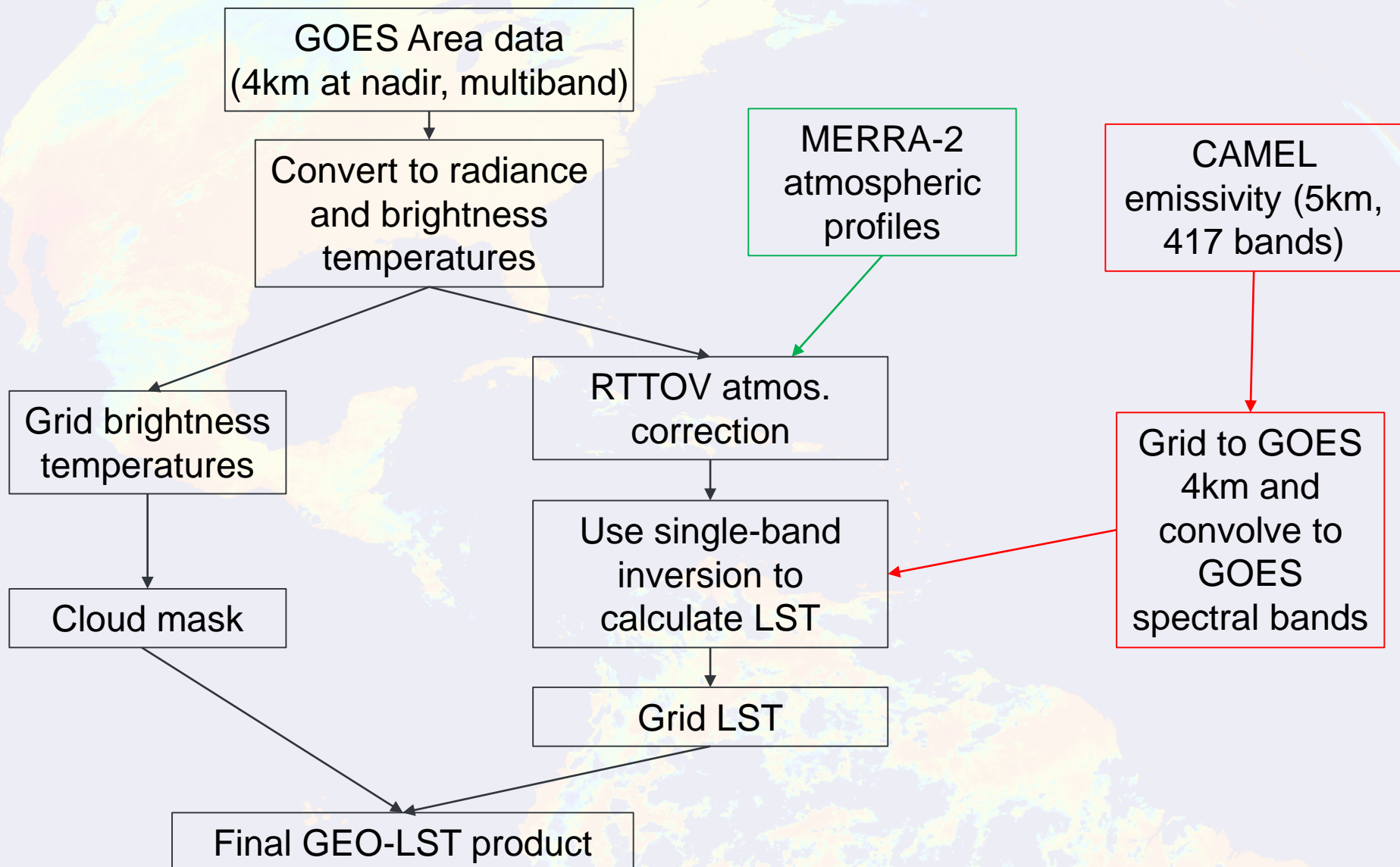
LEO-LST

- MxD11 LST has low uncertainties over vegetation, but larger uncertainties over arid and semi-arid regions
- MxD21 LST has low uncertainty over arid areas, but higher uncertainties over graybody surfaces
- LEO-LST combines these products using an uncertainty analysis

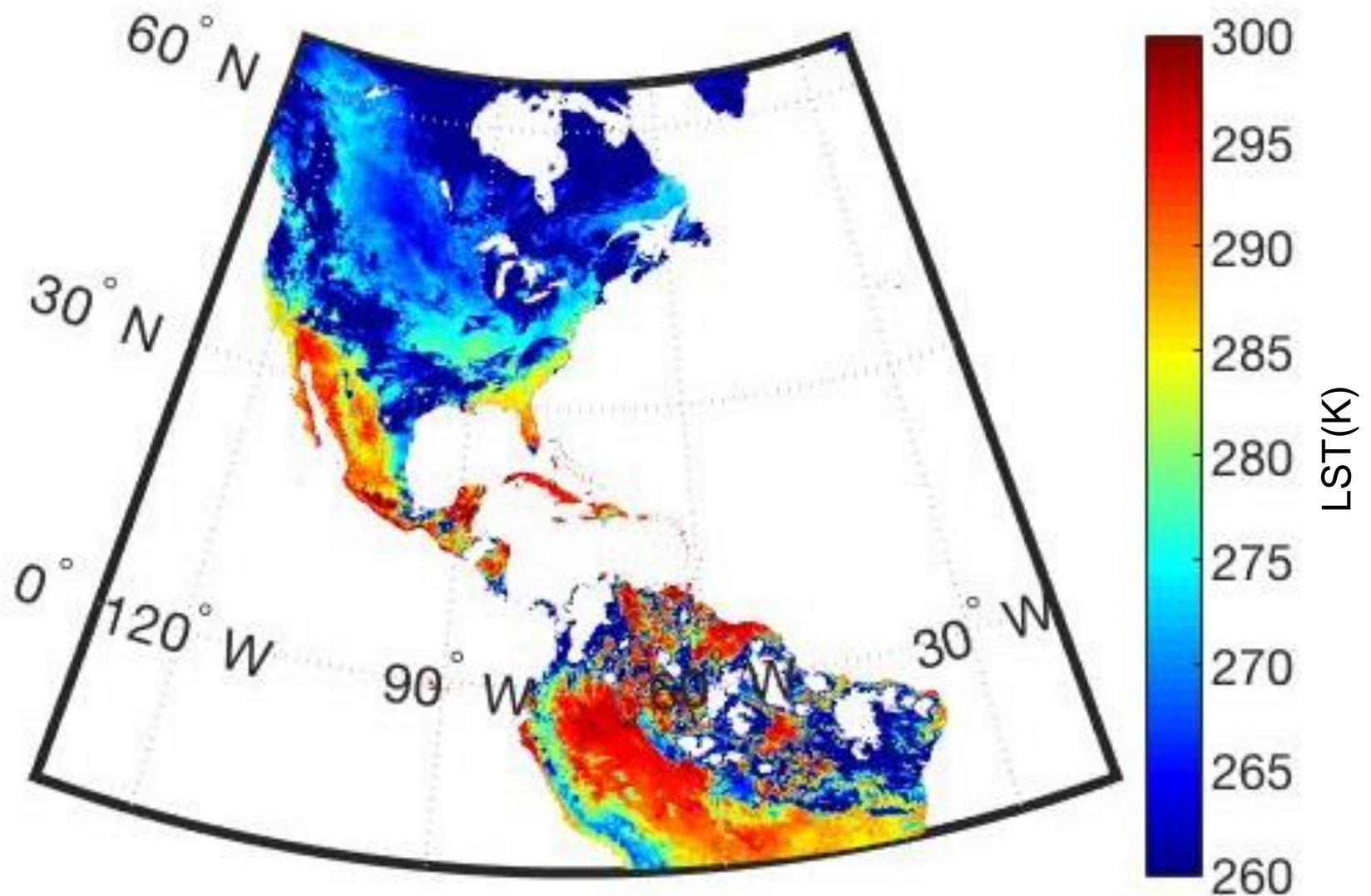
GEO-LST

- Hourly time steps for N. America and 3-hourly time steps for S. America
- GOES 8-15 sensors from 2000-2017
- The hourly GEO LST product is a key variable in the US drought monitoring system for estimating evapotranspiration (ET) over agricultural sectors

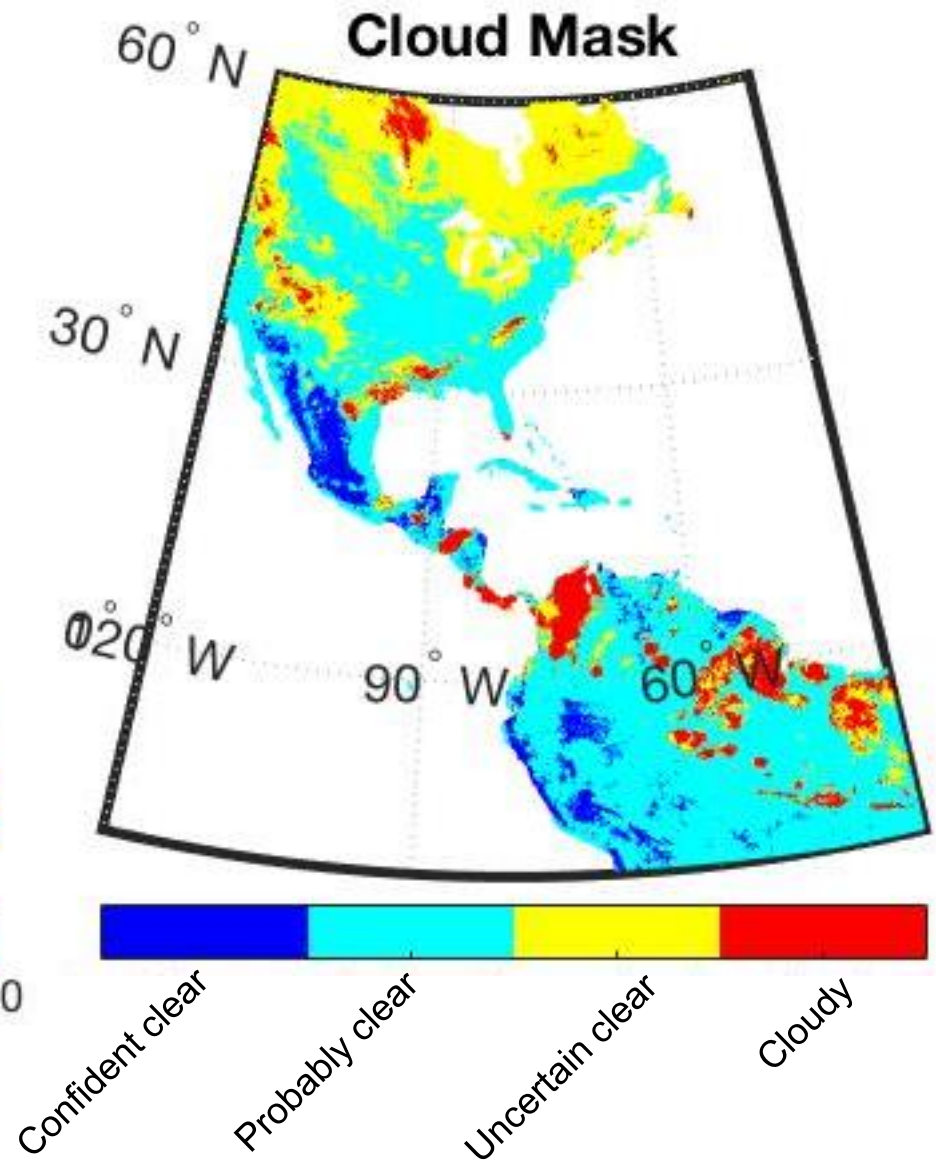
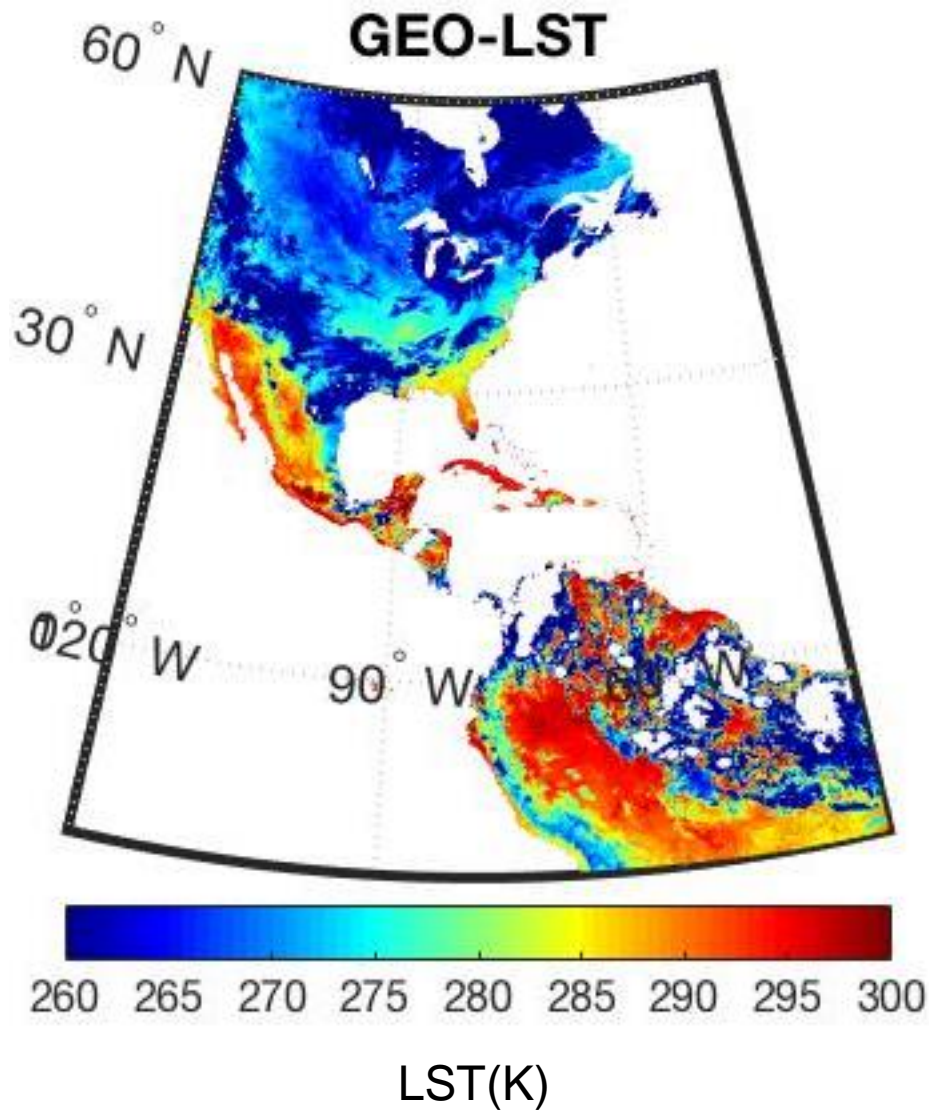
GEO-LST processing



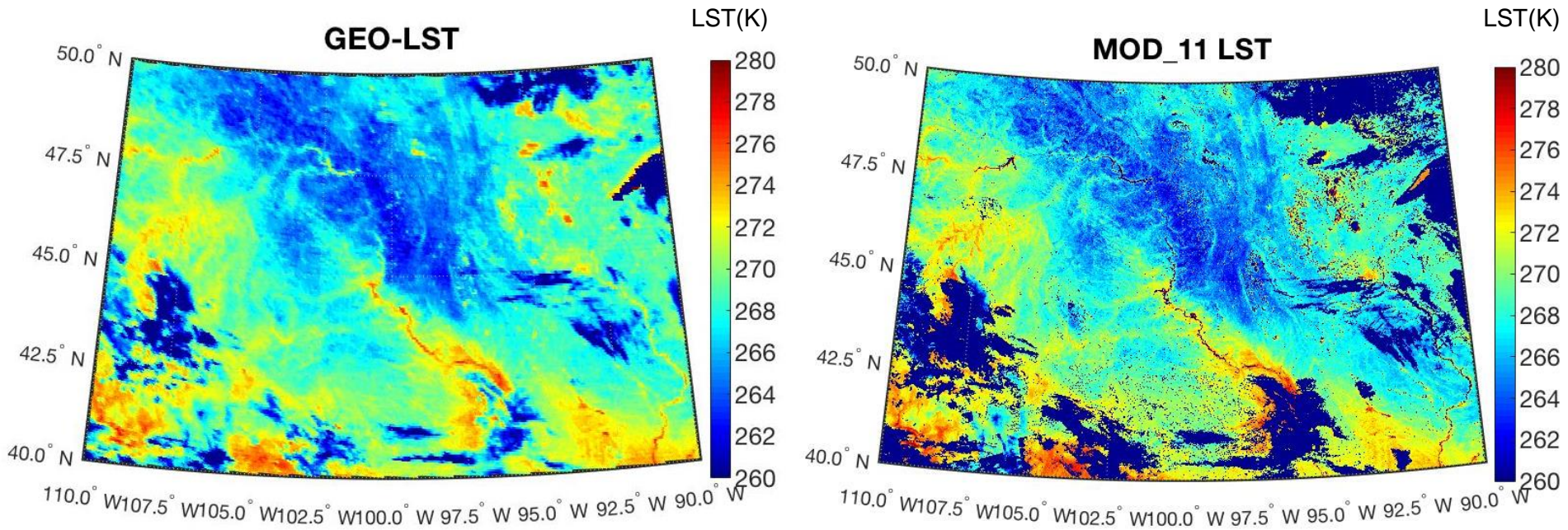
GEO-LST



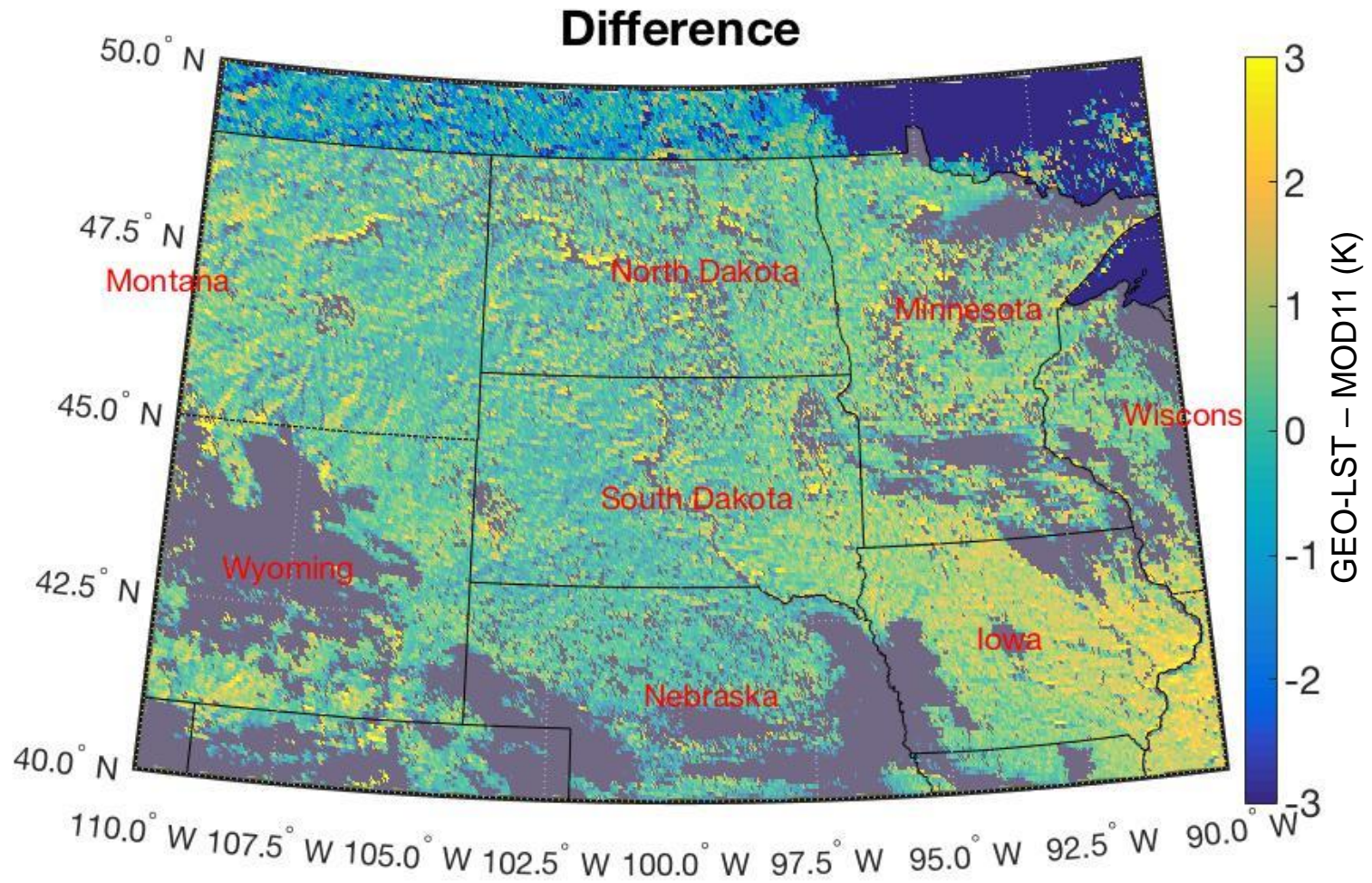
Cloud mask



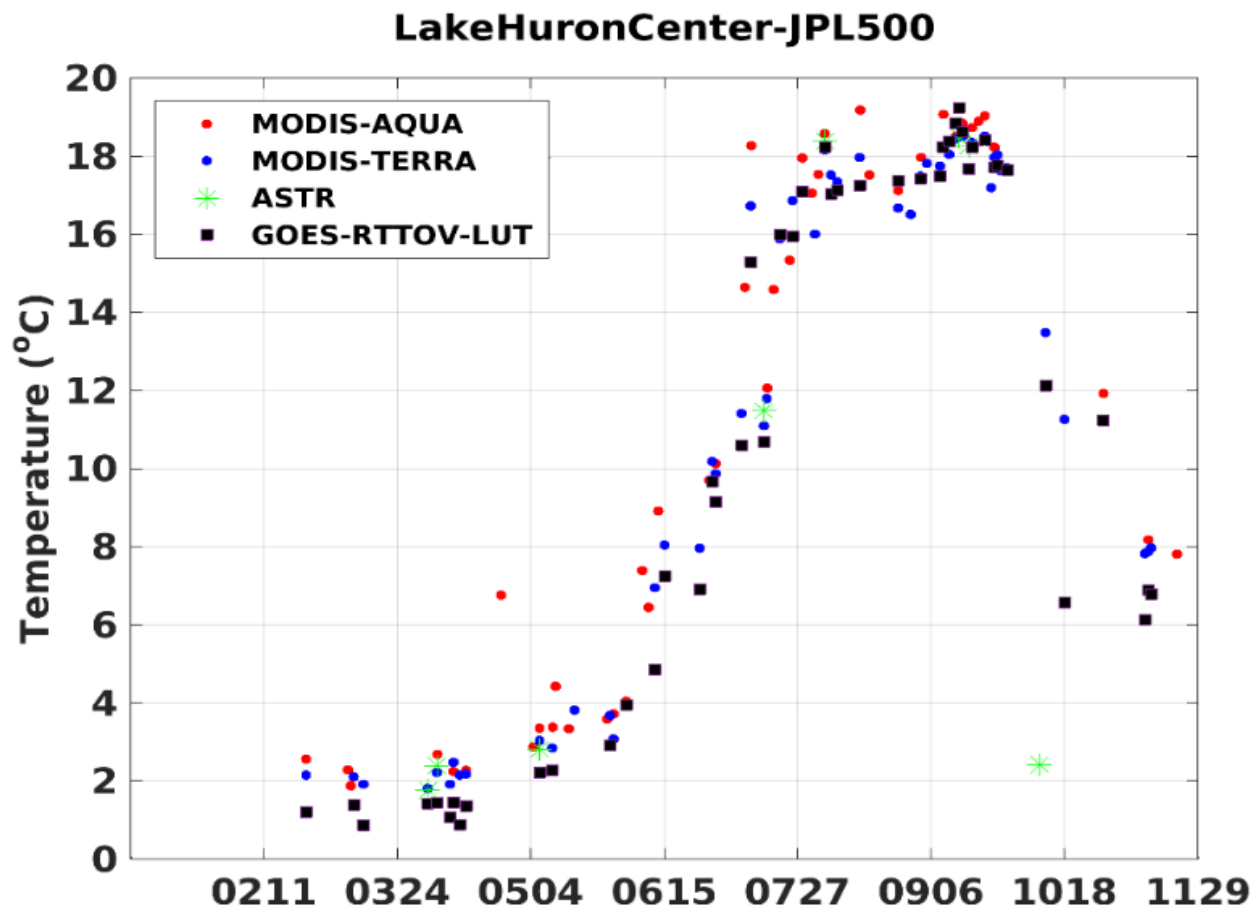
MODIS and GOES LST Comparison (2005-05-03)



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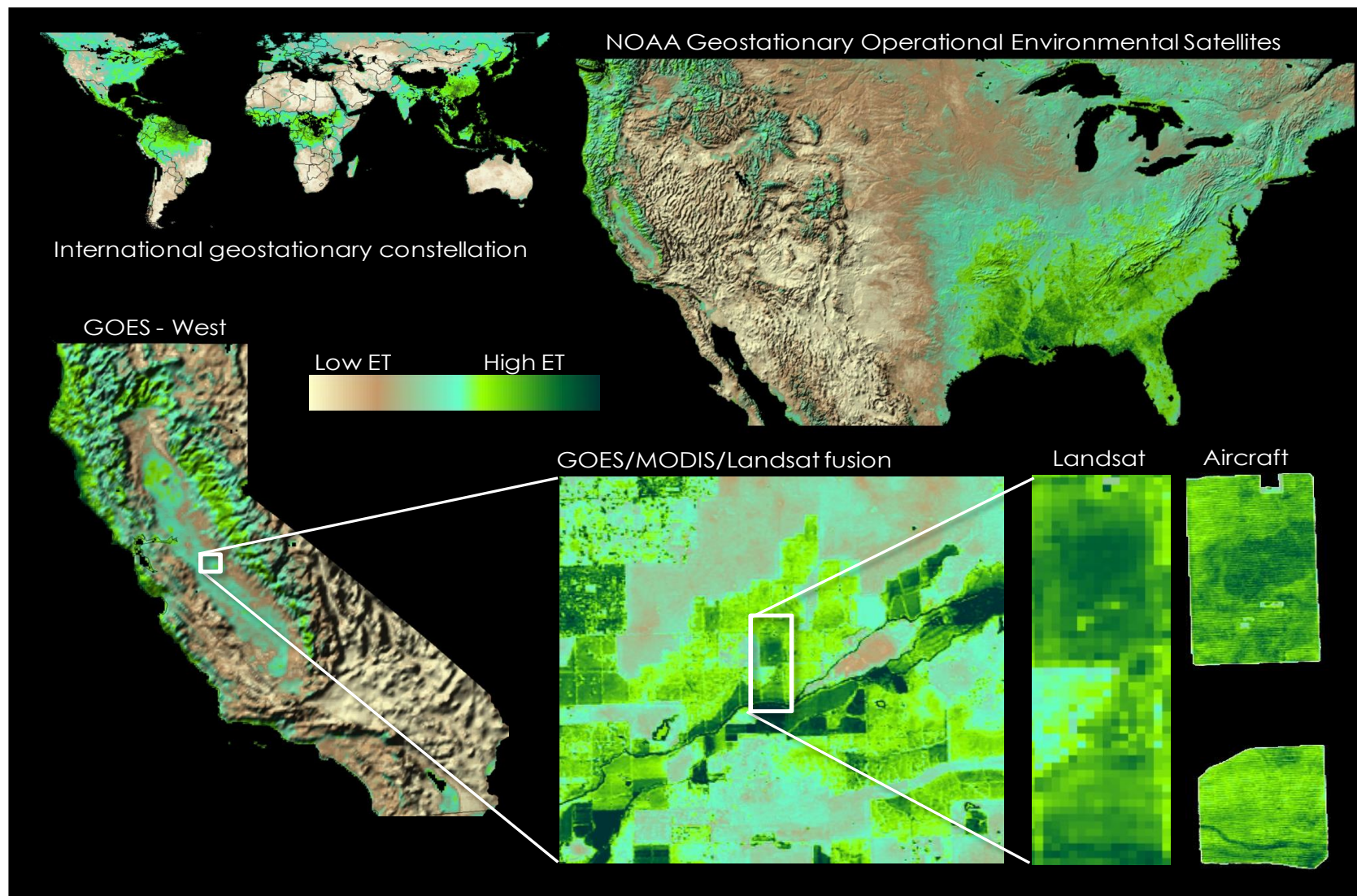


GEO-LST validated against MOD11 at Lake Huron (assumed emissivity = 0.98)



Credit: Rachel Pinker, University of Maryland

Applications



Summary

- MEaSUREs will provide LST at both high spatial and high temporal scales, as well as emissivity at high spectral resolution.
- Consistent, long-term data record.
- GEO-LST will be provided hourly over North America (3-hourly over South America).
- Important for input into climatological models, drought monitoring, etc.



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